*Brain Fag Syndrome (BFS), Sleep, And Beliefs About Sleep Among Secondary School Students In Nigeria*
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**ORIGINAL ARTICLE**

# BRAIN FAG SYNDROME (BFS), SLEEP, AND BELIEFS ABOUT SLEEP AMONG SECONDARY SCHOOL STUDENTS IN NIGERIA

*Ola Bolanle Adeyemi* & Igbokwe, David O***

***Faculty, Department of Behavioural Medicine, Faculty of Clinical Sciences, Lagos State University College of Medicine, PMB 21266, Ikeja, Lagos, Nigeria;**
****Faculty, Clinical Psychologist and Psychotherapist, Psychology Department, School of Human Resource Development, College of Development Studies, Covenant University, Canaanland, Ota, Ogun State, Nigeria.**

## Abstract

***Objective:*** **Brain Fag, a culture bound syndrome which manifests especially among students in Africa was investigated in relation to sleep and beliefs about sleep in a sample of Nigerian secondary school students.** ***Methods:*** **A sample of 500 secondary school students were drawn from six secondary schools in Ile-Ife, Osun State, Nigeria. The Brain Fag Syndrome Scale, Beliefs and Attitude about sleep Questionnaire, and selected items of Pittsburgh Sleep Index were administered on the participants.** ***Results:*** **Students with Brain Fag Syndrome (BFS) slept an average of 5.8 hrs (S.D = 1.1) while those without BFS slept an average of 5.9 hrs (S.D = 1.1). One hundred and eighty two (37.3%) BFS students slept above 6 hrs a day compared with 32 (62.7%) of non BFS students (t = -2.667; df = 49; p = 0.657). Students with BFS (44.3%) slept early while 33.8% of students without BFS slept early ($X^2$ = 7.324, df = 3, p = 0.007). Early insomnia was experienced by 57% of BFS cases while 55% of non BFS cases experienced early insomnia ($X^2$ = 2.019; df = 1; p = 0.155).** ***Conclusion:*** **BFS students in Nigeria to adjust their sleep patterns and habits in order to forestall clinically significant psychological breakdown and impairment in cognitive functioning.** ***ASEAN Journal of Psychiatry, Vol.13 (2): July – December 2012: XX XX.***

**Keywords: Brain Fag, Sleep, Beliefs, Secondary School, Nigeria**

## Introduction

The amount of sleep and the time of sleep do play a part in how prepared a student is to learn [1]. Western studies have documented that students get an average 5 to 6 hours of sleep at night as opposed to the widely accepted healthy range of 8 to 9.5 hours [2,3]. These authors reported similar finding in China where 70% of their high school students slept less than 7 hours at night. According to these authors, about 2 to 5 out of every ten high school students reported significant daytime sleepiness because of unsatisfactory night time sleep.

Sleep deprived students are prevented from absorbing most information in their classes [1]. Moreover, fatigue from lack of sleep prevents students from peak academic performance by hindering memorisation, concentration, reaction time, and coordination. Students receiving poor grades in school were getting less sleep than students receiving good grades [1,3].

Students' mental health and sleep have been found to be significantly associated [4]. These authors reported that sleep problems play a role in behavioural problems. For example, adolescent sleep difficulties are often connected with attention deficit hyperactivity disorder and depression [5]. Irritability, anxiety [5], and decrease in creativity and ability to handle difficult tasks are more behavioural effects of lack of sleep [6]. Furthermore, inadequate emotional information processing [7], increased level of suicidal tendencies [8], poor academic performance [9], daytime leg pain [10], increased body mass index [11], specific phobia, mood disorder, major depressive disorder, obsessive compulsive disorder [12] are common in persons who suffer from sleep deprivation. Moreover, sleep sufferers share many misconceptions about insomnia and sleep and this could result in a vicious cycle of health problems [13].

Brain fag syndrome (BFS) is a mental health problem found among students. BFS has emerged as one of the recurring culture bound syndromes or indigenous psychopathologies in literatures of student's psychopathological response to reading in Africa [14 – 18]. The syndrome was first described half a century ago by Prince as a psychiatric illness associated with study among African students [9]. BFS is a tetrad of somatic complaints; cognitive impairments; sleep related complaints; and other somatic impairments. The somatic complaints consist of pains and burning sensations around the head and neck; the cognitive impairments consist of inability to grasp the meaning of written and sometimes spoken words as well as inability to concentrate and poor retention; sleep related complaints consisting of fatigue and sleepiness in spite of adequate rest; and other somatic impairments such as blurring, eye pain and excessive tearing. BFS affects 6 to 54 students out of 100 [18]. BFS has been found among black South African undergraduate students [20] where 17.7% of the undergraduates had BFS symptoms.

As far back as three decades ago, an association was observed between sleep and BFS [16]. BFS sufferers slept less than controls especially when examination approached adding significantly an average of 2.9 hrs per day to the period they stayed awake than the 1.4 hrs per day of controls. Morakinyo [16] hypothesized that BFS ''is a stress reaction in people with a nervous predisposition induced principally by such factors as sleep deprivation and drug abuse, which are self-imposed in order to ensure successful outcome of an enterprise.''

There is sparseness of studies addressing sleep and sleep patterns in Nigeria. Among the few existing recent studies, focus has been on children and junior secondary school students. For instance, a high prevalence of poor sleep hygiene have been found among Nigerian children aged 2 – 12 in kindergarten, primary and junior secondary class one [21]. If this high prevalence is not addressed, there is a high risk of the children carrying the effect of this poor sleep hygiene over to adolescence and adulthood. This high level of poor sleep hygiene could have resulted to another observation by the same authors [22] who reported a prevalence of headache and migraine among secondary school students in the same Benin City where the aforementioned research on among 2 – 12 year olds was carried out. It has been found that among the major causes of migraine among secondary school students includes emotional stress and sleep deprivation [22]. A high prevalence of sleep disorders have been found among children with neurological disorder in Nigeria [23]. The children 17 years and below reported among other sleep disorders, excessive daytime sleepiness (53.3%). They noted the possibility of cognitive development impairment and low quality of life among these children.

The relationship between BFS, sleep, and beliefs about sleep among sufferers of BFS has not been investigated in Nigeria and other countries according to a diligent electronic search of literature. Finding out more about this relationship has potential clinical benefits for this population of students. This study therefore examines the relationship between BFS, sleep and beliefs about sleep in a sample of Nigerian secondary school students.

## Methods

Five hundred senior secondary school students were recruited by simple random sampling, using odd and even technique from six secondary schools in Ile-Ife after obtaining written informed consent from the students and their parents. The principals and teachers of the schools involved were also formally informed and their consent and approval were also obtained. Research and Ethical Committee of Obafemi Awolowo University Teaching Hospitals Complex, Ile-Ife, approved the study protocol, after which the permission to carry out the study was obtained from the Local Inspectors of Education in charge of the six schools. Before the administration of the instruments to the selected participants, they were told that: (a) their participation was voluntary and there was no foreseeable risk in participation (b) those who refuse to participate would not be penalised or have loss of benefits (c) they should not liaise with each other in answering the questions and any question they might have should be directed to the researcher and (d) this was not a test, and they should answer the questions honestly.

They were then administered a battery of instruments detailing socio-demographic data, Brain Fag Syndrome Scale [24], selected items of Pittsburgh Sleep Index [25] and Beliefs and Attitude about Sleep Questionnaire [13]. The BFSS is a 7-item scale with 3 possible responses (often, sometimes and never with scores 2, 1 and zero) respectively to each item and scores obtainable range from 0 – 14. For caseness, there must be a minimum total score of 6 which must include at least a score of 1 on each of the items 4 and 5 on the other hand. Items 4 and 5 are concerned with the presence of bodily symptoms such as crawling sensation or heat in the head and interference of those bodily symptoms with study. The validity of the scale rests squarely on the construct of the syndrome [24,26,27]. From an empirical factor analysis, the BFSS has been found to have a 2 factor structure and a Cronbach alpha coefficient of 0.521 [28]. The BFS has also been found to be significantly correlated with another measure of brain fag, the Brain Fag Propensity Scale (BFPS) [29].

The PSQI is a self rated questionnaire which assesses sleep quality and disturbances over a month interval. Nineteen individual items generate seven 'components' scores: subjective sleep quality, sleep latency, sleep duration, habitual sleep efficiency, sleep disturbances, use of sleeping medication and daytime dysfunction. The sum of scores from these seven components yields one global score. A global PSQI score greater than 5 has been found to yield a diagnostic sensitivity of 89.6% and a specificity of 86.5% (kappa = 0.75; $p < 0.001$) in distinguishing good and poor sleepers. PSQI has utility in both psychiatric clinical practice and research activities. The PSQI has good validity and reliability with Nigerians [30]. The PSQI consists of ten items each with three possible responses – true, maybe, or false. It assesses positive or negative beliefs and attitudes about sleep.

The data was analysed with the Statistical Package for the Social Sciences (SPSS) for Windows version 15 [31]. The analysis was based on the total number of respondents. For scales and questions with defined categories, frequencies and percentages were calculated for each of the dimensions of BFS, Sleep patterns, and study habits. The Chi Square and student t-test were used to test for the differences in the responses between the groups (BFS and non BFS cases). All the tests were two-tailed and the level of significance was set at 0.05.

## Results

### *Demographics*

The age range of the respondents was between 12 and 24 years; their mean age was 15.5 years (S.D, 1.5). A slightly higher proportion of the respondents were females (53.2%) with a male to female ratio of 1:1.1. Majority were Christians (81.6%) and from monogamous homes (75%). About nine out of ten respondents lived with their parents.

***Socio-demographic Characteristics BFS and non BFS cases***

There was no significant difference between BFS cases and non cases on socio-demographic characteristics as shown in Table 1.

**Table 1. Comparison of BFS and Non-BFS on Sleep Variables: Duration, Categories, Quality and Insomnia.**

| Variable | | BFS | Non- BFS | Total | Significance |
|---|---|---|---|---|---|
| ***Sleep Duration*** | **Mean (SD)**<br>Range | 5.8hrs (±1.1)<br>4 – 9 hrs | 5.9hrs (±1.1)<br>4-10hrs | | t = 1.96<br>df = 498<br>p = 0.35 |
| | 4 –7hrs | 182 (40.5) | 267(59.5) | 448 (89.8) | t =0.898<br>df = 447<br>p > 0.05 |
| | 7.1-10hrs | 19(37.3) | 32(62.7) | 51(10.2) | t = -2.667<br>df = 49<br>p < 0.05 |
| | Total | 201(100) | 299(100) | 100 (100) | |
| ***Sleep Types*** | Early bed/rise<br>Early bed/late rise<br>Late bed/early rise<br>Late bed/late rise<br>Total | 89 (44.3)<br>7 (3.5)<br>103 (51.2)<br>2(1.0)<br>201(100) | 101(33.8)<br>11(3.7)<br>172(57.5)<br>15(5.0)<br>299(100) | 190(38.0)<br>18(3.6)<br>275(55.0)<br>17(3.4)<br>500(100) | $X^2$=10.08<br>df = 3<br>p < 0.05 |
| ***Sleeps Quality (%)*** | Good<br>Poor<br>Total | 144(71.6)<br>57(28.4)<br>201(100) | 278(96.0)<br>12 (4.0)<br>299(100) | 431(86.2)<br>69(13.8)<br>500(100) | $X^2$= 88.04<br>df = 3<br>p < 0.01 |
| ***Insomnia Early*** | Not at all | 87(43.3) | 135(45.2) | 222(44.4) | t= ***-3.627,***<br>p<0.05 |
| | <Once a week<br>1-2 a week | 51(25.4)<br>49(24.4) | 95(31.8)<br>54(18.1) | 146(29.2)<br>103(20.6) | t = 0.78<br>P <0.05 |
| | ≥ 3 a week | 14(7.0) | 15(5.0) | 29(5.8) | t = - 0.1852<br>p > 0.05 |
| ***Middle*** | Not at all | 63(31.3) | 103(34.4) | 166(33.2) | t= - 2.605<br>df= 498<br>p < 0.05 |
| | Yes | 138(68.7) | 196(65.6) | 196(65.6) | t= - 8.804<br>df= 498<br>p < 0.05 |
| | Total | 201(100) | 299 (100) | 500 (100) | |

***Comparison of Sleep parameters and beliefs between BFS and Non BFS cases***

The mean duration of sleep for students with BFS was 5.8 hrs (S.D = 1.1) and for students without BFS 5.9 hrs (S.D = 1.1). No significant difference was observed between the mean sleep duration of students with BFS and students without BFS (t = 1.96; df = 498; p = 0.35). Participants were regrouped into two classes. Group 1 (less than 6hrs of sleep) and group 2 (above 6hrs of sleep). About two in every five (40.5%) students with BFS had less than 6 hrs of sleep compared with three out of every five (59.5%) students without BFS (t = -0.898; df = 447; p = 0.37). On the other hand, one hundred and eighty two (37.3%) BFS students slept above 6 hrs a day compared with 32 (62.7%) of non BFS students (t = -2.667; df = 49; p = 0.657). A significantly higher proportion of students with BFS (44.3%) were in the category of early to bed early to rise compared with 33.8% of students without BFS ($X^2$ = 7.324, df = 3, p = 0.007).

Sleep quality was regrouped into two classes. "Very good" or "fairly good" sleep quality was regrouped as "good" while "fairly bad" or "very bad" was regrouped as "bad". One hundred and forty four (71.6%) BFS students reported they had good sleep quality. Among the students without BFS, 267 (96.0%) reported good sleep quality. About one in three of every student with BFS, however, reported having poor sleep quality compared with four in one hundred of students without BFS (Odds Ratio = 9.47; C.I = 4.81 to 19.93; p = 0.001). ($X^2$ = 59.89)

***Insomnia***

A higher proportion of students either with BFS or without BFS experienced early insomnia. About 57% of BFS cases experienced early insomnia while about 55% of non BFS cases experienced early insomnia. The difference is not significant ($X^2$ = 2.019; df = 1; p = 0.155). About 69% of BFS students had experienced middle insomnia while close to 66% of non BFS students had experienced middle insomnia. This difference is significant (Fisher's exact P = 0.499).

***Beliefs about Sleep***

There was no significant difference between students with BFS and those without BFS concerning beliefs about sleep except one. A higher proportion of students with either BFS or without BFS believed that one needs 8hrs of sleep daily; that nervous break-down follows sleep deprivation; and that if one does not sleep well one cannot function the next day possibly; and that poor sleep results in feeling depressed, irritable or anxious. There was a significant difference in their beliefs that one needs to nap to catch up lost sleep. A higher proportion of students without BFS did not believe that one needs to nap to catch up lost sleep ($X^2$ = 9.63; df = 2; p < 0.008) as shown in Table 2.

**Table 2. Comparison of BFS and Non BFS on Beliefs about Sleep**

| Beliefs | | BFS | Non BFS | Total | Significance |
|---|---|---|---|---|---|
| ***Need 8hrs of Sleep*** | True<br>Maybe<br>False<br>***Total*** | 82 (40.6)<br>56(30.5)<br>62(31.0)<br>200(100) | 121 (40.6)<br>91(30.5)<br>86(28.9)<br>298(100) | 203 (40.8)<br>147(29.5)<br>148(29.7)<br>498(100) | $X^2$ = 0.45<br>df= 2<br>p = 0.79 |
| ***Nap to catch up lost sleep*** | True<br>Maybe<br>False<br>***Total*** | 66(32.9)<br>52(25.9)<br>83(41.3)<br>201(100) | 64 (21.4)<br>106(35.5)<br>129(43.1)<br>299(100) | 130 (26.0)<br>158(31.6)<br>212(42.4)<br>500(100) | $X^2$ = 9.63<br>df= 2<br>p<0.008 |
| ***Nervous break down follows sleep deprivation*** | True<br>Maybe<br>False<br>*Total* | 95(47.3)<br>59(29.4)<br>47(23.4)<br>201(100) | 142(47.5)<br>73(24.4)<br>84(28.1)<br>299(100) | 237(47.4)<br>132(26.4)<br>131(26.2)<br>500(100) | $X^2$ = 2.13<br>df= 2<br>p= 0.345 |
| ***If I don't sleep well I can't function next day possibly*** | True<br>Maybe<br>False<br>***Total*** | 95(47.3)<br>49(24.4)<br>57(28.4)<br>201(100) | 125(41.8)<br>86(28.8)<br>88(29.4)<br>299(100) | 220(44.0)<br>135 (27.0)<br>145(29.0)<br>500(100) | $X^2$ = 1.717<br>df= 2<br>p= 0.424 |
| ***Poor sleep results in feeling depressed, irritable or anxious*** | True<br>Maybe<br>False<br>***Total*** | 73(36.3)<br>60(29.9)<br>68(33.8)<br>201(100) | 109(36.5)<br>88(29.4)<br>102(34.1)<br>299(100) | 182(36.4)<br>148(29.6)<br>170(34.0)<br>500(100) | $X^2$= 0.011<br>df= 2<br>p = 0.995 |

**Predictors of BFS**

Direct logistic regression was performed to assess the impact of a number of factors on the likelihood of predicting BFS. The model contained five independent variables (nap to catch up lost sleep; poor sleep results in feeling depressed, irritable or anxious; early insomnia; middle insomnia; and sleep quality). The full model containing these predictors was statistically significant $\chi^2$ (8, N = 500) = 10.347; p < 0.01 indicating that the model was able to distinguish between respondents who had BFS and those who did not. The model as a whole explained between 3% (Cox and Snell R square) and 5% (Nagelkerke R square) of the variance in BFS status and correctly classified 59.8% of cases. The model showed that only belief that nap to catch up lost sleep made a statistically significant contribution to the model with the odds ratio of 0.816. The OR of 0.816 was less than 1, indicating that BFS respondents were 0.816 times less likely to endorse the belief of nap to catch up lost sleep, controlling for other factors in the model.

**Table 3. Logistic Regression Predicting likelihood of BFS**

| Variables | B | S.E. | Wald | *df* | α | Odds Ratio | 95% OR C.I. Lower | Upper |
|---|---|---|---|---|---|---|---|---|
| ***Early insomnia*** | 0.011 | 0.208 | 0.003 | 1 | 0.959 | 1.011 | 0.673 | 1.519 |
| ***Middle insomnia*** | 0.123 | 0.221 | 0.311 | 1 | 0.577 | 1.131 | 0.733 | 1.745 |
| ***Sleep Quality*** | 0.095 | 0.385 | 0.060 | 1 | 0.806 | 1.099 | 0.517 | 2.338 |
| ***Nap to catch Up lost sleep*** | -0.403 | 0.143 | 4.232 | 1 | 0.047 | 0.816 | 0.481 | 0.886 |
| ***Poor sleep result in feeling depressed irritable or anxious*** | 0.028 | 0.227 | 0.015 | 1 | 0.902 | 1.028 | 0.659 | 1.603 |
| ***Constant*** | 0.434 | 1.086 | 0.160 | 1 | 0.689 | 1.544 | | |

(B = Beta, S.E. = Standard error, df = degree of freedom, α = Level of Significance)

**Discussion**

One major finding in our study is that BFS students did not differ significantly from non BFS students in sleep duration. Both groups of students had insufficient sleep duration. However, a significant proportion of BFS students were early to bed early to rise. The BFS students had been documented to have high achievement orientation [24]. They were highly motivated to study. They therefore would go to bed early in order to wake up early to read. Their high neuroticism made them prone to being anxious to wake up and read. Their anxiety proneness could possibly affect their quality of sleep they would have. It is not at all surprising that a significantly higher proportion of them also reported having poor sleep quality compared with non BFS students.

Morakinyo [16] presented his psycho-physiological theory of BFS by carrying out a clinical investigation of 20 established cases of the Brain Fag Syndrome among the students of University of Ife (now Obafemi Awolowo University, Ile-Ife). He found that BFS sufferers had a very intense drive for achievement and that behind this drive was an anxiety related to the outcome of the educational programme on which the students were engaged. This anxiety made the students adopt a system of study which led to sleep deprivation with use of stimulants to stay awake. The sleep deprivation in turn created an abnormal psycho-physiological state in them including cognitive dysfunction. This cognitive dysfunction also constituted a severe threat to their ambition and in turn led to a generation of more tension. A vicious cycle was therefore established which eventually led to BFS.

He had previously found that BFS patients had higher scores on the neuroticism-stability dimension of the Eysenck Personality Inventory (EPI) but not different on the Extraversion-Introversion dimension. He therefore concluded that BFS was the consequence of interplay of psychological and physiological factors in a person of nervous predisposition. The physiological factors identified included sleep deprivation and psycho-stimulant use while the

psychological factor included achievement motivation.

The psycho-physiological theory adequately explains the cognitive deficits, the study difficulty and the use of stimulants found in BFS patients. It also explains the appreciable degree of BFS among learners in terms of stress, and sleep deprivation among other factors.

Another important finding is that students with BFS had positive knowledge about sleep deprivation and its consequences. However, there is a gap between their beliefs and their behaviour. BFS Students believed that one needs 8hrs of sleep daily; that nervous break-down follows sleep deprivation; and that if one does not sleep well one cannot function the next day possibly; and that poor sleep results in feeling depressed, irritable or anxious. Despite these beliefs, they still had less than 6 hrs of sleep daily, less than the healthy range of 8-9 hours [2]. This gap in belief translating to practice has clinical implications for BFS students particularly. The anxiety and worries about failure and their high achievement orientation are more powerful factors that predict their sleep behaviour than beliefs. This may be of clinical importance in counselling BFS students. However, more clinical studies are needed to confirm this. Objective sleep studies on BFS students would likely reveal sleep fragmentation or reduced amount of slow wave sleep or reduction in REM sleep.

Interestingly, our finding among secondary school students in Nigeria is similar to a finding of mean sleep duration of 6.2 hours of night-time sleep for Nigerian undergraduate students[32]. Non restorative sleep and intra-night awakening have also been found to be frequent among Nigerian undergraduates [32] and also similar to the mean sleep time of 6.02, 5.62, and 4.86 for $10^{th}$, $11^{th}$, and $12^{th}$ graders respectively in Korean teenagers [33].

Authors are in concurrence on the efficacy of Cognitive Behaviour Therapy (CBT) in the treatment of the misconceptions and beliefs shared by insomnia sufferers about insomnia and sleep [34,35]. Some of these misconceptions could be corrected through CBT. More recently, an offshoot of CBT, Cognitive Behavioural Treatment for Insomnia (CBT - I) [36] has been described by the National Sleep Foundation [37] as an efficient treatment procedure for insomnia where sleep restriction, stimulus control instructions, sleep hygiene education and relapse prevention are integrated in assisting the patient adjust.

In countries like the United States of America, few schools have taken into consideration the biological sleeping times of high school students [38,39]. In the schools that did, there appeared to be many positive impacts. When classes start later in the morning, there is less sleep deprivation and sleep quality is better [40,41]. The behaviour of early to bed early to rise might change if schools adopt a starting time policy that considers the biological sleeping times of high school students. Attendance has also been shown to improve as well as delayed sleep onset, longer sleep duration, daytime alertness and better grades among students with late class starting times [38,39,42].

From preliminary investigations, it appears that students are showing great signs of improvement where educational policy has considered adolescents' sleep patterns vis a vis academic performance [38, 39]. In these places, students reported they felt less tired and more competent to take on difficult tasks. This is in support of the findings that uninterrupted sleep is important for human beings to experience periods of rapid eye movement (REM) necessary for learning, problem solving and storing memories [43, 44]. For students with BFS, alteration in school time table would have positive impact on their sleep quality and consequently their learning, problem solving and memories.

**Conclusion**

This study has provided preliminary baseline data on the sleep behaviour, BFS and beliefs about sleep among secondary school students in Nigeria. This study suggests the need for BFS students in Nigeria to adjust their sleep patterns and habits in order to forestall clinically significant psychological breakdown and

impairment in cognitive functioning and suggests that alteration in school time table for students with BFS would impact positively on the learning outcomes.

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**Corresponding author:** ***Ola Bolanle Adeyemi, Faculty, Department of Behavioural Medicine, Faculty of Clinical Sciences, Lagos State University College of Medicine, PMB 21266, Ikeja, Lagos, Nigeria.***

**Email:** wobola@yahoo.com

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